Programming Education
— Learn to Code Initiatives for K-12 —

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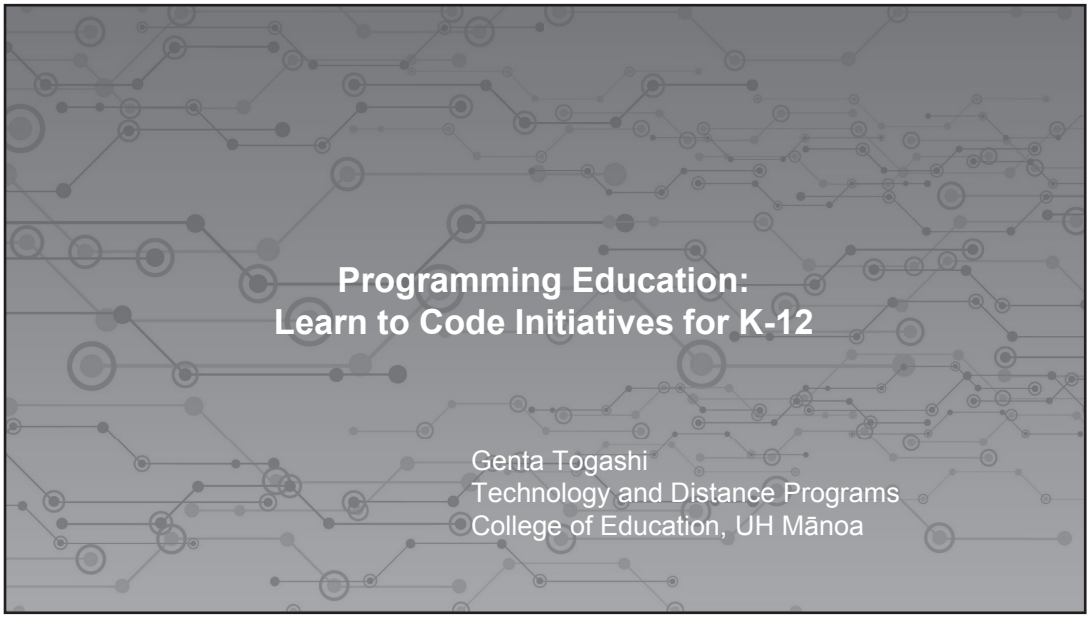
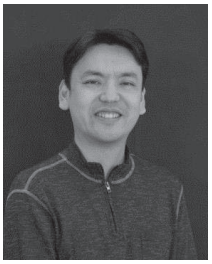
Abstract

Programming and Computer Science Education in K-12 schools are becoming a hot topic in Hawai'i. Due to recently passed laws, Hawai'i Department of Education is going to start offering Computer Science curriculums for all children in K-12 public schools by 2022. This presentation will inform the recent movement of programming education in the U.S. Firstly, we will review the overview of programming education in the U.S. including the timeline of public initiatives in the last decade, and three important characteristics of the U.S. Computer Science education will be presented. Then, we will compare three major coding lesson tools: Code.org, Google CS First, and Apple Learn to Code and examine the different focus of each coding tool. Finally, we will discuss key design considerations for implementing computer programing curriculums for K-12 education.



Introduction



Genta Togashi

- Information Technology Specialist
  College of Education, University of Hawaii
  (2004 ~ Present)
  Design and Implementation of
  College's database infrastructure

- MS in Information and Computer Sciences (2009)
- MED in Learning Design and Technologies (expected 2019)

Agenda

1. Rationale of Programming Education for K-12
2. Learn to Code Educational Contents
3. Considerations in Curriculum Design

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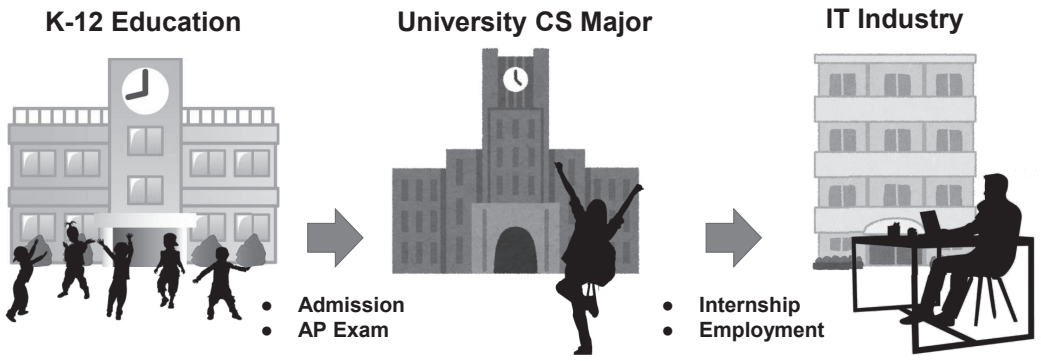
Rationale of Programming Education for K-12

Timeline

Year	Event
2007	“Computational Thinking” by Dr. Jannet Wing
2012	CSTA K-12 Computer Science Standards
2013	Launch of Code.org
2016	CS For All – President Obama’s Initiative
2018	Hawaii Bills for Computer Science Education

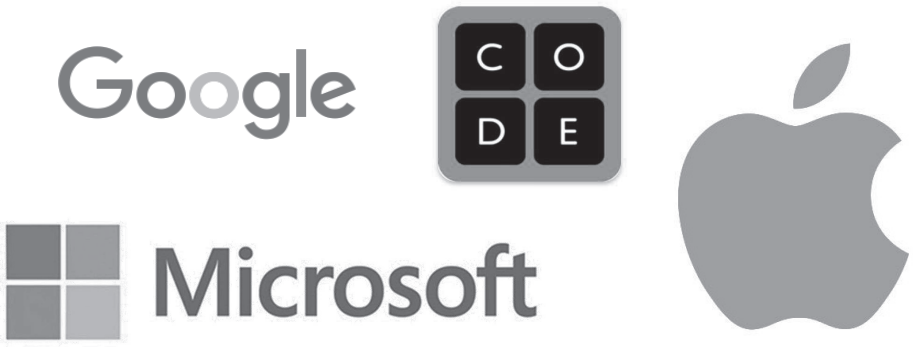
Feature 1. Mitigating the Shortage of IT Professionals



Feature 2. Exposing K-12 Students to Computer Science

- CSTA standard
- Align with CS at University level
- Common Keywords:
  - Algorithm
  - Problem Solving
  - Data Visualization
- Science vs. Engineering

Feature 3. Industry-Driven Initiatives



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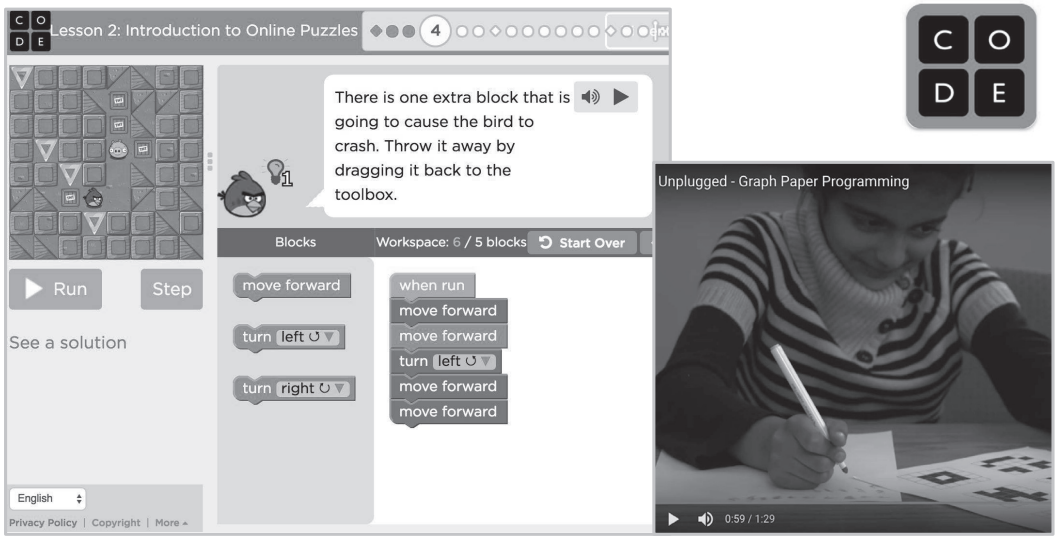
Learn to Code Educational Contents

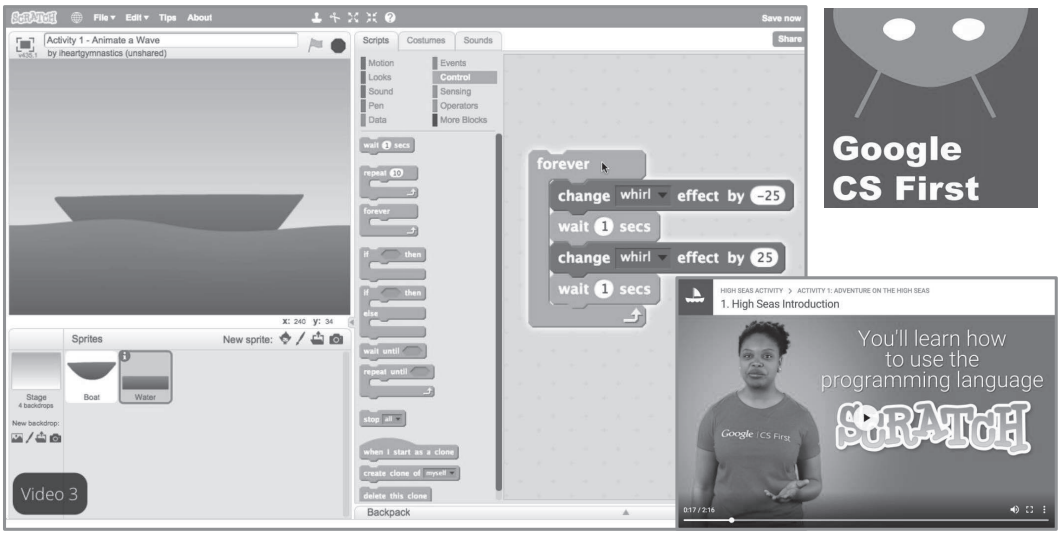
Code.org

- The most popular CS learning material for K-12
- Visual coding with “Blockly”
- Unplugged activities
- Many professional development opportunities
- Hour of Code Events



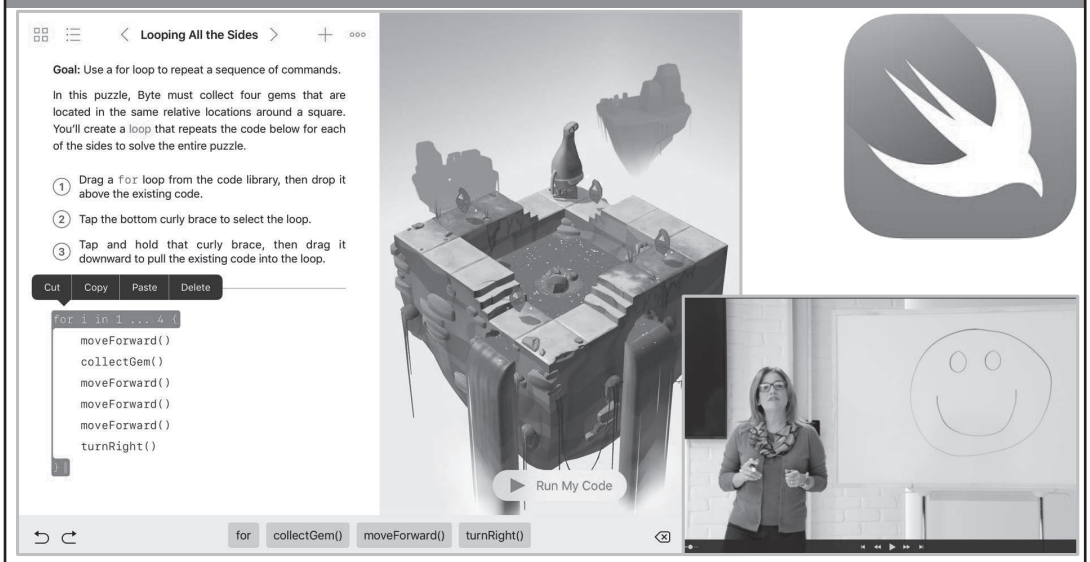
Google CS First

- Based on “Scratch” developed by MIT
- Instructional Videos
- Can be very creative and remix programs
- Used in clubs and afterschool programs



Apple Learn to Code

- Based on “Swift Playgrounds"
- Text-based coding
- Very attractive visual design
- iPad is required
- Field trips to Apple store



Comparison of Tools

	Input	Output	Uses
Ordinary Coding	Text	General purpose	-
Scratch (Google CS First)	Block	General purpose	Creatively develop/remix programs
Swift Playgrounds (Apple Learn to Code)	Text	Prepared visualization	Learning how to write text-based coding
Blockly (Code.org)	Block	Prepared visualization	Learning logic

3

Considerations in Curriculum Design

Group Project

- Significant gap between students who develop coding skill in a short time and those who struggle to learn
- Creates an environment to help each other
- Students can get credits for contributing their teams such as leadership, communication, research, design work, etc…

Facilitator of Learning

- Area of programming and computer science are expanding and transforming on daily basis. It is very difficult for an instructor to be the source of all knowledge taught in a class.
- Utilizing various online resources, an instructor will guide students on how they can gain the knowledge by themselves.
- Check out “Singapore's 21st-Century Teaching Strategies”

Thanks!

Slides are available at http://go.hawaii.edu/owf

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